Scottish Home and Health Department
Scottish Health Service Planning Council

Prostheses, Orthoses and Aids for the Disabled

Report by a Working Group of the Prosthetics and Orthotics Committee

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First published 1983

ISBN 0 11 492258 6

Note by Scottish Home and Health Department
This Report was prepared by a Working Group on behalf of the Prosthetics and Orthotics Committee and endorsed by the Scottish Health Service Planning Council. It is now issued for information.

The Report must not be taken as reflecting Departmental policy. However, Health Boards should have regard to the recommendations within the limits imposed by their resources.

Chairman's Preface

The Working Group on Prostheses, Orthoses and Aids for the Disabled was faced with a major task in attempting to predict the likely long-term developments in the prosthetics and orthotics services and other aids for the disabled. In our deliberations we were conscious of the need to set these in the context of the broader developing field of rehabilitation. We were also aware that other Groups were engaged in the preparation of more detailed reports on the Wheelchair and Orthopaedic Footwear Services; and these should be considered together with this document as a blueprint for the future.[1] We envisage our report as a starting point for others and to this end have attempted to define the important areas for further study.

Because of the membership of the Working Group, and of the Prosthetics and Orthotics Committee, we limited our remit to the locomotor system. This excluded other aspects of prosthetic replacement in physical rehabilitation such as the provision of artificial breast and larynx replacements, and the development of appliances for colostomy and ileostomy care.

We have received valuable comments on a draft of this report from the National Consultative Committees and these have been incorporated wherever possible. Inevitably some of our recommendations have already been implemented and progress has been made in other areas, such as the incorporation of prosthetists into the health service.

As Chairman of the Working Group I wish to place on record my thanks to the members for their hard work over many meetings. Many others helped us in our task and we are particularly grateful to the members of our parent Prosthetics and Orthotics Committee for their advice and guidance. The secretarial support we received was excellent and it is largely due to the efforts of our secretaries that this report has reached a satisfactory final form.

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[1] Scottish Home and Health Department: Scottish Health Service Planning Council (1982); The Wheelchair Service in Scotland: A Report by a Working Group of the Prosthetics and Orthotics Committee (Chairman: Professor J Williamson). Edinburgh HMSO.
Scottish Home and Health Department: Scottish Health Service Planning Council (1982); The Orthopaedic Footwear Service in Scotland: A Report by a Working Group of the Prosthetics and Orthotics Committee (Chairman: Mr D G Young). Edinburgh HMSO.

David L Hamblen
April 1982

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1 Introduction

1.1 The Consultative Document 'The Health Service in Scotland—The Way Ahead'[1] published in 1976 identified the services for the physically disabled, and, in particular, the prosthetic and orthotic services, as one of the priority areas in need of development.

1.2 The increasing emphasis that Governments have given in recent years to improving the services for the physically disabled has raised expectations which will be frustrated by failure to develop the services. It is important that any decisions taken in the short term to meet these justifiable expectations should not be incompatible with the long-term aims for the development of the service. These considerations made it opportune to review present provision in the National Health Service and to consider how the prosthetic and orthotic services should be developed in the future.

1.3 At the beginning of 1978 the Prosthetics and Orthotics Committee of the Advisory Group on Medical and Scientific Equipment and Aids for the Disabled (Appendix A) formed a Working Group to study this problem. The Working Group took as its remit

> 'to consider and make recommendations on what developments are desirable in relation to the supply of prostheses, orthoses and aids for the disabled having regard to the need to provide an integrated rehabilitation service for the physically disabled'.

The Working Group was selected from the members of the parent Committee to provide a broad coverage of the subjects under discussion and additional members were co-opted to provide advice in the prosthetics and orthotics field. The membership of the Working Group is shown at page 7.

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[1] Scottish Home and Health Department (1976). 'The Health Service in Scotland—The Way Ahead.' Edinburgh, HMSO.

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1.4 The need for such a study has been reinforced by the Report of the Royal Commission on the National Health Service[1] which states:—

> '. . . the complexity of the various rehabilitation services, and the financial support available, hinder action and themselves generate problems. . . . Clearly the need for effective rehabilitation services will increase in the future as provision for caring for patients in the community is further expanded. It seems to us that this must be an important factor in future NHS planning.'

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[1] Royal Commission on the National Health Service (1979). Report (Cmnd 7615). London, HMSO.

2 The Numbers Involved

2.1 The definition of a physically disabled person causes difficulties. The definition of disability adopted by the United Nations General Assembly is, '. . . any person unable to ensure by himself or herself, wholly or partly, the necessities of a normal individual and/or social life, as a result of a deficiency, either congenital or not, in his or her physical or mental capabilities.' It follows therefore that physical disability is not the same as physical handicap, as some disabled persons are able to overcome, to a greater extent than others, their individual and social disadvantage. It is thus not possible to be precise about the numbers using the NHS facilities for the disabled.

2.2 There are, however, a number of indicators that can be used:—

a. the 'Amelia Harris'[1] survey of the physically disabled in Great Britain, published in 1971, related to persons aged 16 and over living in the community. An abstract of this report was prepared by Mrs Vera Carstairs and published in the April 1972 edition of the Health Bulletin.[2] This shows that 274,000 persons living in the community in Scotland have some degree of disability; 16,000 (5.9%) are classified as very severe, 35,000 (12.7%) as severe, 57,000 (21.1%) as appreciable and 167,000 (60.7%) as minor. Fuller information on this report is given at Appendix B.

b. A survey on congenital limb anomalies using data from the Edinburgh Register of the Newborn (1964-68) shows an incidence of anomalies of 31.8 per 10,000 births. If extrapolated to Scotland this would give about 235 births annually with some congenital limb anomaly.

c. About 46,500 orthopaedic appliances and 9,000 pairs of surgical footwear are supplied annually (a patient may be supplied with two or more pairs of surgical footwear).

d. There are 9,500 amputees on the register and about 1,000 new amputees are fitted with limbs in a year. Available data on age structure is given at Appendix B.

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[1] Office of Population Censuses and Surveys (1971). 'Handicapped and Impaired in Great Britain.' London, HMSO.

[2] Carstairs, V (1972). *Health Bulletin*, XXX(2), 103.

e. About 18,000 wheelchairs are on issue; but again a user may have more than one wheelchair supplied and it is not possible to say with any accuracy the number of wheelchair users in Scotland. A rough estimate might be between 10,000-12,000. It is perhaps worthy of note that the number of persons receiving assistance with mobility (mobility allowance, invalid vehicle etc) in Scotland in 1978 was just over 12,000.

2.3 As has been said these are no more than indicators but, if the Amelia Harris survey is taken as a base, there are about 110,000 people aged 16 and over living in the community with a disability ranging from appreciable to very severe. Taking such information as is available on the different aids provided by the National Health Service it is perhaps reasonable to assume that something of the order of 75,000 disabled persons are using some form of aid provided by the National Health Service; and there is, in addition, almost certainly an unidentified unmet need.

3 Present Provision and the Need for Change

3.1 The provision of services for the physically disabled in the National Health Service is an integral part of the activities of specialties involved with particular groups of patients, eg, geriatric medicine, orthopaedic surgery, paediatrics, neurosurgery. However, it could be said that there has been no conscious planning of the development of these facilities, which have been provided in response to particular needs that have been identified. Whilst this may have been satisfactory in the short-term, it has militated against the rational development of the services with the result that they have become fragmented rather than integrated. These problems were further compounded following the reorganisation of the Health Service in 1974 when responsibility for the supply of different types of aids for the disabled was split between the National Health Service and Local Authority Social Work Departments. Recommendations on the areas of responsibility are given in NHS Memorandum No 1976 (GEN)90[1]. The following paragraphs outline the present arrangements in a number of services in the National Health Service involved in the provision of aids for the physically disabled and bring out the need for planned changes if full advantage is to be taken both of technological advances and of new materials affecting the range of aids that are now available.

Medical Rehabilitation

3.2 The overall emphasis in National Health Service provision for the physically disabled is on medical rehabilitation. It is unnecessary to say much about present provision since the medical rehabilitation services were comprehensively examined by a Sub-Committee of the Scottish Standing Medical Advisory Committee and its report—commonly known as 'The

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[1] Scottish Home and Health Department (1976). Provision by Health Boards and Local Authorities of Aids and Equipment for Disabled People and Adaptations to their Homes (NHS Memorandum No 1976(Gen) 90). Edinburgh, the Department.

Mair Report'[1]—outlined the way in which the Sub-Committee saw the medical rehabilitation services developing.

3.3 Medical rehabilitation was defined in the Mair Report as implying 'the restoration of patients to the fullest physical, mental and social capability'. Although the National Health Service is directly concerned only with medical rehabilitation, both in hospital and in the community, this definition in itself indicates that rehabilitation is a process going beyond the medical field: education, housing, social work and employment and voluntary services must also be involved, all with close links to one another if the disabled person is to be given as high a quality of life as is possible having regard to his disability. This implies that the developing rehabilitation services should be increasingly involved with the services providing prosthetic and orthotic devices and aids for the disabled.

3.4 Probably the most disappointing feature of the present medical rehabilitation services is that there has been little attempt to forge real links between the different services involved in the provision of National Health Service aids to the disabled, eg nursing, physiotherapy, remedial gymnastics, occupational therapy, orthotic and prosthetic. There is, in our opinion, a need to rectify this; and Health Boards should be asked to submit detailed reports on the rehabilitation service they provide at present and how they see it being developed with particular reference to the need for a coordinated approach.

3.5 The Mair Report also stressed the need for multidisciplinary teams, but staffing levels—at least in some of the professions—are still far short of those needed to provide an adequate service of this nature.

Remedial Professions

3.6 An essential part of the medical rehabilitation of the physically disabled is the work of the remedial professions, aimed at helping patients to recover as quickly as possible their fullest physical, mental and social capability. If full function cannot be achieved their aim is to minimise loss of function and to help patients with a permanent disability to regain the maximum degree of function, to adapt to the residual disability and to lead as normal lives as possible. Under the present health service arrangements, most remedial therapists are given very little part to play in the provision of aids for the physically disabled and they lack a defined role in the prosthetic and orthotic fields. Remedial gymnasts may give advice on the ordering of prostheses but have more contact with patients in the early stages of their use of prostheses. Some occupational therapists participate in the assessment of disability but few see their patients through all the stages of rehabilitation. Similarly physiotherapists may be responsible for training patients to increase their mobility by the use of prostheses and orthotic devices but have no part in the assessment and prescription phases. There is an obvious need for a greater involvement of therapists at every stage of the rehabilitation process. However, this is dependent on adequate staffing levels; and therapists are still in short supply. There are also implications for their training, which may be inadequate at present for this new role. The Report of 1973 on the Remedial Professions[1] (the McMillan Report), whilst applying to England and Wales only, is likely to play an important role in the development of these professions in Scotland and should lead to a more cohesive organisation than exists at present.

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[1] Scottish Health Services Council (1972). 'Medical Rehabilitation: the Pattern for the Future.' Edinburgh, HMSO.

3.7 Like medical rehabilitation itself, the work of the remedial professions extends beyond the hospital services into the community; both the primary care and local authority services are involved, as is the voluntary sector. The Chronically Sick and Disabled Persons Act 1970 gave an impetus to the development of domiciliary social services for the physically disabled; for example, the need for local authorities to advise on adaptations to buildings and to assess requirements for aids to daily living has, among other things, led to an increase in the number of occupational therapists working in the Social Work Departments of Local Authorities.

3.8 It is inevitable that the roles of health service and local authority occupational therapists should, in some areas, overlap; and it is difficult, and indeed undesirable, to draw a rigid dividing line. But with scarce resources—both manpower and financial—there is an urgent need to ensure that duplication and waste of effort are avoided.

Prosthetics and Orthotics

3.9 Many of the permanently physically disabled using the National Health Service require an aid of some description, be it an artificial limb, a caliper, a body support or a walking aid. The services should be organised so that the aid most appropriate to the individual patient's needs can be accurately identified, prescribed and supplied promptly and without difficulty. This is not the situation at present because of fragmentation, and because of a lack of rational development, in the prosthetic and orthotic services. There is clearly a close link between the services and the skills needed to make and fit a prosthesis or an orthosis, but the development of the two services within the National Health Service has been quite separate. There is an undoubted need, therefore, for rationalisation of the two services and the assimilation of prosthetists into the health service should be a valuable first stage in achieving this aim. (See paragraphs 3.11 *et seq*).

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[1] Department of Health and Social Security (1973). 'The Remedial Professions.' London, HMSO.

3.10 The basic need is for simplicity of provision and as long ago as 1968 the Planning Unit Report No 2 of the British Medical Association on Aids for the Disabled[1] drew attention to the administrative complexities in the provision of aids. The foreword to that Report said: 'There are two main criticisms. Much of the equipment is clumsy and old-fashioned and its delivery to the user is often inordinately delayed by a slow and cumbersome administrative procedure'.

Prosthetics

3.11 In 1948 the arrangements for the supply of artificial limbs to war pensioners by the Ministry of Pensions were extended to cover all National Health Service patients; but it was not until 1953 that the responsibility for the artificial limb service was transferred to the Secretary of State for Scotland. Whilst from that time the clinical component of the prosthetic service was integrated into the National Health Service—unlike England and Wales where it continues to be part of the central department—the existing administrative organisation continued to apply. This has meant that the service, up to and including the fitting of artificial limbs, continues to be contractor based with different contractors meeting the needs of upper and lower limb amputees and more than one contractor operating in the lower limb field. Improvements have been introduced into the service over the years, but the basic organisation has remained unchanged.

3.12 The organisation of the artificial limb or prosthetic service was subject to rigorous scrutiny by a Working Party set up by the Secretary of State and its report (the Denny Report)[2] made a number of major recommendations some of which have already been implemented, eg the establishment of the National Centre for Training and Education in Prosthetics and

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[1] British Medical Association (1968). Aids for the Disabled (Planning Unit report no 2). London, the Association.

[2] Scottish Home and Health Department (1970). 'The Future of the Artificial Limb Service in Scotland.' Edinburgh, HMSO.

Orthotics at the University of Strathclyde, whose development is controlled by a Board representative of the University, the National Health Service and the Scottish Home and Health Department.

3.13 The most fundamental recommendation made by the Working Party was that prosthetists should be of professional status, should work as full members of a clinic team and to be truly objective should be employed by the National Health Service. Implementation of this proposal in 1980 was a logical step in the development of the prosthetic services. The Denny Report also recommended that the prosthetic technicians employed at artificial limb centres should be employed by the National Health Service.

3.14 There have undoubtedly been improvements in the prosthetic service since the Denny Report was published: it might be said that the report acted as a catalyst in this regard. But these improvements did not remove the basic illogicality of the distinction between upper and lower limb fitting, though with the incorporation of prosthetists into the health service this differentiation should disappear.

3.15 The Mair Report, in supporting the recommendations of the Denny Report, stated that it was important that the artificial limb service (or prosthetic service) should be seen in the context of a comprehensive rehabilitation service. It also noted that many of the needs of the amputee (now particularly the elderly amputee) and other patients requiring rehabilitation were identical and could be adequately catered for in one rehabilitation department, with consequent savings in staff and accommodation. This point is accepted and it applies with equal force to the orthotic service.

3.16 The prosthetic service, unlike the orthotic service, is at present funded directly by the Scottish Home and Health Department. This is an anomaly which militates against complete NHS integration and the development of the co-ordinated rehabilitation service to which we refer later. It is recommended that the funding of the prosthetic service by the Scottish Home and Health Department should be reviewed.

Orthotics

3.17 On the introduction of the National Health Service there were a number of orthopaedic appliance workshops (now to be called orthotic centres) in hospitals which then became part of the health service. These workshops which it is estimated provide about 30% of the orthotic needs of the National Health Service in Scotland provide for all the needs of some hospitals, part of the needs of others and none of the needs of the remainder. Operating alongside these is a contractor-based service which is more fragmented and less well organised than the contractor-based prosthetic service. While there have also been developments in the orthotic service leading to improvement, the basic organisation, like that of the prosthetic service, has remained unchanged.

3.18 In 1977 that part of the orthotic service provided by National Health Service orthopaedic appliance workshops was surveyed by the Scottish Standing Committee on Prosthetics and Orthotics. Their report drew attention to the urgent need to review the grading of staff. It showed that little if any effort had been made to keep this service under review and to ensure that the staff were properly graded and trained in the use of new technology and of new materials. As a result outdated appliances were often being provided. The report recommended that there should be a thorough review of the service, that the workshops should be renamed orthotic centres and that two-tier staffing, comprising orthotists and orthotic technicians, should be introduced.

3.19 The consideration now being given by Health Boards to this report will indicate how they see their orthotic service developing and the relative roles of the hospital workshop and commercial suppliers. The Health Board may, however, look for a policy decision on whether the emphasis should be on the development of NHS orthotic centres or on the continuing use of contractors. Before such a decision can be taken it will be necessary to review the capacity of the present workshops having regard both to the physical facilities and to the quality of staff available. In reaching a decision some of the questions to be answered are:—

a. Should the NHS orthotic centres continue to function at their present capacity or should they be developed to meet a greater percentage of the total requirements of the National Health Service?
b. Should the NHS orthotic and prosthetic services be combined and enlarged as part of an integrated rehabilitation engineering service as this is subsequently discussed in paragraph 5.3?
c. Should there continue to be reliance on the use of orthopaedic appliance contractors and, if so, to what extent and should there be closer links between them and the orthotic centres on sharing of work loads?
d. Is there a way of simplifying the prescribing and ordering procedures in view of the present discrepancy of documentation between the contractor and hospital-based services.

As trained staff become available from the National Centre for Training and Education in Prosthetics and Orthotics so will it be possible to develop the NHS orthotic centres.

Need for Change in the Prosthetic and Orthotic Services

3.20 There is a need for a simplification of the present supply arrangements for orthopaedic appliances. The revised Handbook on Surgical Appliances should give staff involved in the service a greater appreciation of their responsibilities. But it does not change the procedure in any major way. The procedure applying to the patient should be as simple as possible. For example, it is important that the patient should look on the hospital supplying the appliance as the hospital that should thereafter be approached for modification and replacements. This has not, in the past, applied in all cases.

3.21 There is a need for the integration, as circumstances permit, of the prosthetic and orthotic services. As has been said, the two services have developed separately; but they have more similarities than differences. Reports such as the Mair Report, the Denny Report and the Report of the British Orthopaedic Association have already pointed to the need for their integration. Such integration makes much sense: the two services are concerned with the restoration or replacement of function, they are both essentially multidisciplinary, orthopaedic and rehabilitation medicine consultants are involved in both and an integration of the services would make for greater simplicity in clinic arrangements. Physiotherapists, remedial gymnasts and occupational therapists have an important part to play in both and orthotists and prosthetists have a similar theoretical basis for their work and may utilise common manufacturing techniques. An integrated service would also provide a more convenient service for patients in that it would be possible for at least some replacement and repair of limbs to be undertaken at 'satellite centres' nearer the patients' homes. This will be discussed later.

3.22 The training needs of all staff involved in the prosthetic and orthotic services must be recognised, particularly those of prosthetists and orthotists who must be competent to fit the wide range of appliances now available. Much is already being done to achieve this by the various courses at the National Centre for Training and Education in Prosthetics and Orthotics. The setting up of the National Centre, the facilities and resources of which are probably without parallel anywhere, provides a unique opportunity to develop the necessary comprehensive training and education programme for all the disciplines involved; and this opportunity should be used to the full. In order to provide adequate technical support for the prosthetic and orthotic services, it is recommended that the technician training programme currently being produced by the National Centre in conjunction with the Scottish Technical Education Council should be brought into operation as soon as possible. The setting up, on a United Kingdom basis, of a body to oversee the training and education arrangements for prosthetists and orthotists which will also be responsible for their registration is strongly recommended. In making this recommendation the Working Group is aware of the discussions with regard to the provision of such a body, which are continuing at the present time and which may involve the Council for Professions Supplementary to Medicine.

Prescription of Prostheses, Orthoses and Aids

3.23 There is a need for improvement in the present method of documentation used for prescribing prostheses and orthoses for the disabled and it is suggested that a combined order/prescription form might be used throughout Scotland. The present forms used for orthoses present difficulty when prescribing contemporary devices and it is felt that their interpretation should not be left to the hospital appliance officer. A more specific prescription form is necessary indicating a clear description of the function of the appliance to be supplied. The form should include the diagnosis with a description of the resultant disability and what the appliance aims to achieve. This will allow more interaction with the prosthetist/orthotist who will be in a position to suggest alternative prescriptions where appropriate. The completion of the form would be checked before it is passed to the supplier, either NHS or commercial, and a copy of the form should be retained in the hospital record. At present this is not the case and at clinic visits there is no clear information on what has been prescribed for the individual patient.

Multiple signing of forms prior to completion, where practised, should cease and a consultant or other competent health service professional should check that the patient has received the appliance prescribed. Although the format would be identical, it is suggested that a different colour of paper should be used for the prescription forms for orthoses, prostheses and aids for the disabled. An extension of the use of the EC10 form for prescription of an increased range of simple appliances by general practitioners is not recommended.

Surgical Footwear

3.24 Most knowledgeable observers consider that the standard of provision in this aspect of the orthotic service has deteriorated. The present service is dependent on a declining number of commercial contractors; adequately trained staff are extremely scarce; and no training schemes are available.

3.25 These deficiencies are discussed very fully in Report 78/1 on The

Orthopaedic Footwear Industry[1]. That report brings out very clearly that urgent action is needed on recruitment and training of staff and other matters if what might be regarded as a crisis situation in 4 or 5 years' time is to be avoided. There is a reluctance for firms or individuals to move into the highly specialised orthopaedic footwear industry from the mass produced general footwear market and those firms already in the industry have an ageing workforce, many of whom are close to retirement. Whilst the report is of a study of the manufacture of orthopaedic footwear in England and Wales, the points made in it had already been recognised in Scotland and, as indicated in the preface to this report, a Working Group which has now reported was set up to examine the problems.[2]

3.26 The entire basis of the existing supply system must be reappraised, eg:

a. prescription practices must be reviewed with a view to reducing the volume of inappropriately prescribed items;
b. methods of fabrication must be carefully examined to establish the best available modern practice;
c. available manufacturing services should be considered with regard to available competence and a decision reached regarding the future role of the commercial contractors and the NHS orthotic centres respectively.

Wheelchairs

3.27 Many disabled patients are wheelchair users. As a wheelchair may be the only means of mobility for the disabled person, certainly within the home, the arrangements for identifying need and the type of wheelchair required to meet that need as well as the arrangements for prescription and supply must be simple and speedy. There must also be sound arrangements for meeting the needs of a patient who will not benefit from one of the standard range of wheelchairs.

3.28 The Secretary of State asked the Prosthetics and Orthotics Committee to examine this important aspect of services for the physically disabled. As indicated in the preface, a Working Group was set up under the chairmanship of Professor Williamson and its findings are the subject of a separate report.[3]

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[1] Disabilities Study Unit (1978). The Orthopaedic Footwear Industry (Report 78/1). Arundel, the Unit.

[2] Scottish Home and Health Department: Scottish Health Service Planning Council (1982); The Orthopaedic Footwear Service in Scotland: A Report by a Working Group of the Prosthetics and Orthotics Committee (Chairman: Mr D G Young). Edinburgh HMSO.

[3] Scottish Home and Health Department: Scottish Health Service Planning Council (1982); The Wheelchair Service in Scotland: A Report by a Working Group of the Prosthetics and Orthotics Committee (Chairman: Professor J Williamson). Edinburgh HMSO.

4 Identification of Unfulfilled Needs and Assessment

In an attempt to provide a realistic basis for planning future provision in the services for the physically disabled the Working Group chose to consider the identification of unmet needs and the assessment of disabilities.

Identification of Unmet Needs

4.1 The Group felt that in addition to the needs being met by existing provision, there existed a large unmet need in the community. In some hospital departments, such as orthopaedics, geriatric medicine and rheumatology, co-ordinated rehabilitation is already an integral part of the specialty, but in other disciplines—particularly primary care—there is little provision and better methods are required to identify the need. This will involve greater integration between general practitioners, health visitors, community paediatricians, community nurses and hospital departments. It is to be hoped that the general practitioner will enhance his role as co-ordinator.

The potential groups for whom special provision is required are broadly identified as follows:—

a. Children with single system defects.
b. Children with multiple system defects such as spina bifida and cerebral palsy.
c. Adults with single system disabilities from the effects of trauma, arthritis, multiple sclerosis or neoplasm of the limbs, including some amuptees.
d. Adults with multiple disabilities from degenerative diseases or as sequelae to childhood disorders.
e. Elderly patients, particularly those incapacitated by strokes, or by a single disability superimposed on senile dementia and/or social deprivation.
f. The patient with a longstanding physical disability, such as paraplegia, who has been stabilised under the old system of supply and who might still be using an outdated device.

It is felt that, in general, children and the elderly were amongst those most poorly served under the present provision for disability.

The specialised services for patients with spinal paralysis from injury are not fully developed in Scotland. There is need for a planned development to serve the country as a whole, with closer integration into any other developments in the rehabilitation services using the most modern techniques available.

Methods for Assessment

4.2 Once the need of a disabled person is identified a procedure is required to assess that need. For single system problems the appropriate hospital specialist, or a general practitioner properly trained in rehabilitation, should be able to carry out this assessment and order the appropriate aid or appliance. In many cases additional help in assessment will be required from individual members of the remedial professions or rehabilitation engineers. However, multiple disability always requires a team able to cope with the detailed assessment of the patient as a whole. Ideally this team should be responsible for the full range of rehabilitation activities from identification, through assessment and prescription, to the provision of prostheses, orthoses and aids. All these activities could be encompassed by a multidisciplinary team working in a rehabilitation assessment centre under the direction of a consultant in rehabilitation medicine. However, this ideal has yet to emerge fully and will probably only be developed on a limited scale to serve the main centres of population. In other areas, where the need is smaller, assessment could be undertaken at satellite centres in the district general hospital, provided that the paramedical staff had received training and were supported by clinic visits from the responsible rehabilitation consultant.

The Elderly

4.3 These patients, who constitute an increasing number of the population, are probably the largest group whose needs in this area are unmet. Their admission with an acute problem, such as a fracture or a stroke, often signals the end of their independent existence because of the lack of a co-ordinated and planned rehabilitation programme. Such a programme is essential as it allows early recognition of the multiple problems which may occur in patients who are already frail and disabled in some degree; and hopefully it prevents as many as possible of these patients from joining the lengthening queue of patients requiring long-term geriatric care. In some patients essential surgery, such as amputation, is required, leading to further disability. It is noted that over 75% of new amputees are now over the age of 65 years. With elderly amputees rehabilitation must start early to be effective, with ready access to the different services that might be required such as physiotherapy, occupational therapy and the provision of prostheses and orthotic aids. There is also a great need for all the hospital-based services, including those provided by the remedial professions, to have closer liaison with the community services before the patient's discharge from hospital to ensure adequate support in the home environment. On the siting of centres to cope with the rehabilitation needs of the elderly close consultation would be required between the geriatrician and the general practitioners. At the same time it is felt that there is a need to expand this aspect of the geriatric service in preference to the provision of additional long-stay accommodation.

Disabled Children

4.4 Some childhood disabilities are capable of recognition by neonatal paediatricians in the early months of life, others are not identified until the child commences school. Prior to 1974 many were identified during the period of schooling by the excellent screening services provided by School Medical Officers. The disruption of that service brought about by the reorganisation of the health service is of considerable concern and the general shortage of clinical medical officers, as they are now designated, may require a greater involvement of general practitioners in this work. Those general practitioners who become heavily involved are likely to require suitable additional postgraduate training which, besides proving attractive, could be of benefit in other aspects of their practice. This trend could be advantageous since the Working Group felt that the appropriate route of referral for assessment and treatment should be through the primary care physician and not directly from the clinical medical officer. Since there are probably insufficient paediatricians to allow them to become too closely involved in the reorganised school health service, the Group felt that a case could be made for a combined paediatrics/primary care service on a National basis. This might include an expansion of the present paediatric developmental screening programme.

4.5 The Group envisaged that assessment of the handicapped child would function on a three tier basis—at local level, at district level and at area level. Initial identification might be by the general practitioner or the clinical medical officer with a child, where necessary, being referred by the former to a District Assessment Centre which would normally be associated with a district general hospital. This would create the opportunity for multidisciplinary assessment in association with specialist paediatricians. Most problems could be dealt with at this level but for a few with more complex problems further referral to an Area Assessment Centre might be required. This Centre might be part of the service provided within the framework of a children's hospital or unit, or it might be associated with a major rehabilitation assessment centre where this existed. However, the special needs of children for separate accommodation and staffing place constraints on any standardised form of planning for this provision.

4.6 The objective of these arrangements is to prevent the children, particularly those with multiple handicap, being assessed by different groups at different times with little or no exchange of information between the groups. At present affected infants can be undergoing assessment by developmental screening units, pre-school boards and selection boards for special schools for the physically handicapped. The advantages of the child being assessed by one multidisciplinary team based on the children's hospital or in a children's unit in the area, or alternatively within the main rehabilitation centre are obvious and desirable. The appropriate information gleaned from such an assessment could then be made available to the education authorities and medical personnel concerned with the child's future care. Liaison between the paediatric multidisciplinary team and those who will be caring for the child on reaching adult status will be vital. Lack of continuity of care has frequently further disadvantaged a disabled child at a time of considerable change in his or her life, when the needs of employment add additional pressures.

4.7 Transportation of disabled children to the main centre for developmental screening remains a problem since the majority of the centres are not located within the health service and ambulance transportation is therefore not available. Local authority transport, on the other hand, is not always equipped to transport children at risk such as those suffering from brittle bones or muscular dystrophy or those who are severe spastics. This lack of a satisfactory transportation system, which is applicable to the disabled in general and not only to children, is considered to be one of the factors which has led to a proliferation of unco-ordinated peripheral services, each with its own separate documentation. Similarly ambulances are not designed to transport patients' aids or their wheelchairs, and without their presence further difficulties in assessment can arise. It has been agreed by the Chief Officer of the Ambulance Service that patients can be accompanied by their wheelchairs where this is required for the specific medical needs of the patient. Some of the problems could more readily be resolved by the establishment of a district aids advisory service operated by occupational therapists, physiotherapists, remedial gymnasts and nurses acting on the advice of the Area Assessment Centre.

4.8 The Working Party noted that a report entitled 'Towards Better Health Care for Schoolchildren in Scotland', which contains a section 'Assessment of Children with Handicap'[1] has been produced by the Child Health Programme Planning Group and the recommendations contained in this report require study in connection with the long-term development of the prosthetics and orthotics services.

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[1] Scottish Home and Health Department (1979). Towards Better Health Care for Schoolchildren in Scotland: a report of the Child Health Programme Planning Group (Chairman: R Barclay). HMSO, Edinburgh.

5 Particular Aspects of Development

Multidisciplinary Nature of the Service

5.1 We have referred on a number of occasions, first, to the need for integration rather than fragmentation and, secondly, to the need for multidisciplinary working. Integration in the fullest sense cannot be achieved without multidisciplinary working; and only if multidisciplinary working is practised in a real way will the best possible level of health care be available to the disabled patient.

5.2 The medical treatment of the physically disabled is multidisciplinary to a unique degree extending beyond normal hospital disciplines. It is, for example, multidisciplinary to the extent that the surgeon operating in the area of prosthetics and orthotics should have an understanding of biomechanics, and of the principles of alignment, as well as of the properties of the materials and devices used if his surgery is to be relevant to the total problem. Also prosthetic and orthotic treatment in the clinic cannot be applied with success except by a multidisciplinary approach which takes account of all the patient's needs.

Rehabilitation Engineering Centres

5.3 If the general proposition that there should be an integration of the prosthetic and orthotic services is accepted it would seem to follow that comprehensive centres dealing with all types of equipment for the physically disabled that are provided by the National Health Service should be established. These centres, which would be known as Rehabilitation Engineering Centres, would be multidisciplinary and would have bioengineers, orthotists and prosthetists, working closely with the remedial professions and other professional staff. Within these Centres, and in accordance with current practice, all these professionals would be administratively accountable for standards of work and management matters within their own profession but would be responsible to the medical consultants for clinical matters affecting patient care. Managerial responsibility for the Centres will be for Health Boards to decide but may rest with Directors who could be senior members of any of the professions working within the Centres. A schematic layout of a suggested Medical Rehabilitation Service including a Rehabilitation Engineering Centre is at Appendix E. This diagram shows a functional relationship but does not have any hierarchical significance.

5.4 The contribution that bioengineers working in this field, ie rehabilitation engineers, can make in the provision of an effective service has not been fully recognised. It is perhaps worth noting that a Canadian survey indicates that 'a biomechanics team including a rehabilitation enginer can be supported by a population of 200,000 or over and that one engineer per 200,000 is a reasonable ratio'. It has been suggested that this is a modest estimate; but even so Scotland at present falls far short of that ratio. An expansion of these numbers and improved integration into the health service are essential if there is to be any improvement in the service for provision of aids for the physically disabled. In addition to the role of the graduate bioengineer as a rehabilitation engineer, there is a place within this profession for the technically qualified engineer working under the general direction of the graduate. This would encompass the present grade of technical officer within the proposed structure.

5.5 The value of the concept of Rehabilitation Engineering Centres has already been demonstrated by the developments at Princess Margaret Rose Hospital, Edinburgh, and the Dundee Limb Fitting Centre. What remains to be established is the number of centres required to cover Scotland, together with particulars of the resources which will be involved. There will, therefore, probably be a need to undertake a study to assess the numbers of physically disabled that might be expected to use the centres. It may be that no more than three or four will be needed. These could provide limited services to a number of 'satellite centres' which would not need the same number of staff or the same facilities. It is recommended that Rehabilitation Engineering Centres and Rehabilitation Consultants working outside these Centres should have a number of short stay beds available for the use of their patients.

Training

5.6 If the services for the physically disabled are to be developed effectively the staff must be suitably qualified and trained, the training to cover not only their basic training but also appropriate refresher and new development courses. Such courses should cover all staff involved with the physically disabled and some should be multidisciplinary. Health authorities should be encouraged to release staff for such training. Where this is difficult, for example, in the case of a small orthotic centre, arrangements should be made for the secondment of a member of staff from a larger centre, if necessary from another area, to cover the period of the course. Staff employed by contractors should have the same qualifications and training as are required for health service staff and they should also attend appropriate short refresher and new development courses. The National Centre for Training and Education in Prosthetics and Orthotics already has a programme of short courses. This programme should be expanded; and this can probably be done within the projected staffing levels of the National Centre. All courses need not be undertaken at the National Centre itself.

5.7 At present there is a total lack of teaching of medical students at the undergraduate level in the fields of prosthetics and orthotics. There is a clear need to include some fundamental instruction in any undergraduate curriculum to provide basic information on the fitting and adjustment of prostheses and orthoses This would be the appropriate responsibility of teachers in orthopaedic surgery, in collaboration with those teaching in the field of rehabilitation.

5.8 There is a need for instructional courses and seminars covering the function and supply arrangements of all the aids provided by local authorities as well as of those provided by the National Health Service. If resources are available for teaching this could be provided through the Universities closely involved with rehabilitation studies (currently Dundee, Edinburgh and Strathclyde) and through other centres providing rehabilitation services. In an attempt to meet part of this need, consideration has been given within the Scottish Home and Health Department to utilising the facilities of the National Centre by enabling it to hold short courses and seminars on aids. As part of that assessment a series of four fact-finding seminars have been held and a report is to be prepared which will be considered. Any initiative in this field is welcome and it is recommended that, in addition to their own considerations, the Scottish Home and Health Department should also be invited to consider with Health Boards, Universities, Social Work Departments and the Central Council for the Training and Education of Social Workers how the total need should be met. Training courses should involve the staff of the voluntary organisations.

Dissemination of Information

5.9 There is a general need for improvement in communication for all involved with the physically disabled; and with no-one is it more important to communicate than with the disabled person himself, who is at present too often confused about or unaware of the services and facilities available. Those working with the physically disabled can themselves do much to effect an improvement but there is also a need for more basic initiatives. Some suggestions are:—

a. closer co-operation between the hospital service and community based services including the voluntary sector;
b. establishment of Aids Demonstration Centres by Health Boards, staffed by personnel knowledgeable about help available, to provide a focal point for the disabled in the area and linked with any planned programme of exhibitions of different ranges of aids and equipment for the disabled at, for example, the Scottish Health Service Centre;
c. close links between the centres at b. and the Scottish Information Service for the Disabled and the Mobile Aids Centre of the Scottish Council on Disability;
d. development of the 'Rehabilitation Forum' programme of the Scottish Council on Disability involving those working in the field and the disabled; and
e. increased use of the facilities at the National Centre for Training and Education in Prosthetics and Orthotics, and elsewhere, for short multidisciplinary seminars and courses, including seminars for workers in the voluntary sector.

Aids Demonstration Centres

5.10 It is suggested that Aids Demonstration Centres should form an integral part of the Rehabilitation Engineering Centres when established. They should function on the same model as the prosthetics and orthotics facilities, with satellite centres distributed throughout the country. The main centre would normally be the responsibility of specialists in rehabilitation medicine in overall charge and should include an educational component for professionals, in association with a demonstration area and an information service for both professionals and the general public. The present Mobile Aids Centre, under the aegis of the Scottish Council on Disability, would be a useful adjunct to the proposed static centres; and it is suggested that small versions of the aids centre might be established as 'shop-windows' where trained staff could instruct the public by displaying and demonstrating aids prescribable through NHS and commercial suppliers. These could also provide an information service covering all aspects of disablement including entitlement to mobility allowance, attendance allowances and other forms of social support. This proposal has considerable training implications and would require an expansion of the present facilities in the field. It will be for Health Boards to consider whether Aids Demonstration Centres should be linked with their existing aids supply organisation.

Research Development and Evaluation

5.11 The current programme of research, development and evaluation being undertaken under the auspices of the Prosthetics and Orthotics Committee is given at Appendix C. The Committee is responsible for identifying research, development and evaluation needs and also for considering individual applications that may come before it from workers in the field. Both of these are equally important. The active worker in the field is encouraged to develop his bright ideas; but the Committee also examines research and development being undertaken, and, in relation to the needs of the service, attempts to direct research effort into the most appropriate areas. Commissioning research in this way is very difficult and along with the other research funding Committees of SHHD, the Prosthetic and Orthotics Committee is finding ways of encouraging research to be undertaken in areas where needs have been identified.

5.12 In developing the research, development and evaluation programme, the multidisciplinary character of the services must be kept in mind. Research, for example, must be undertaken throughout the spectrum of scientific disciplines including, for example, ergonomics, mechanical, electrical and electronic engineering, materials science, control systems and related computer theory, physiology including biophysics and biochemistry, psychology, sociology and related sciences.

5.13 Clinical trials in this field are inherently more complex than in others. Rarely if ever can a placebo be used and this means that there is no baseline of treatment that can be used for comparison in, for example, evaluating devices or systems. Nor can treatment be withheld from a patient as part of a structured clinical trial. Devices applied to a patient are tested—and must be tested—in a situation which is highly dependent on the accuracy of fit of the system of which the device is an integral part.

5.14 For the same reasons that apply to research and development, evaluation in this field is difficult and complex and can be time-consuming. A sub-group appointed by the now defunct Scottish Standing Committee on Prosthetics and Orthotics produced an evaluation protocol (Appendix D). It is recommended that this should be used as the base document for future evaluations and amended and expanded as the need arises.

5.15 Research, development and evaluation leads to the setting up of standards, national and international; and such standards are required for orthoses and prostheses already in general service use. A start has been made by the Health Departments, in conjunction with the International Society for Prosthetics and Orthotics, at a series of international meetings and conferences, to set up such standards. The International Standards Organisation has now established a new Technical Committee—TC168—to consider standards in orthotics and external prosthetics. It is important that Scotland should continue to be fully involved in this important aspect of the service and indeed with international developments in this field in general. Such involvement could well save the needless waste of resources, both of money and of manpower, in developments that have already been considered elsewhere.

Production and Provision of Prostheses and Orthoses

5.16 The Group considered the procedures for prescribing and ordering prostheses and orthoses and, in particular, the problem of who should be responsible for these functions and at what level.

Prostheses

5.17

a. Clinicians trained in this specialty should be ultimately responsible for the initial prescription of all prostheses. However, the prescription may be the product of discussions within the clinic team.
b. The decision to replace or repair a prosthesis might be the responsibility of the prosthetist member of the clinic team but much would depend on his training, the reasons for replacement or repair, and the presence or absence of other factors which might require consideration.
c. The need for clinical review of patients and the interval between these reviews would be influenced by a number of factors such as the age of the patient, his physical and mental condition, the condition of the stump, and his social and working environment. Each Centre should establish a system for periodic review with particular attention being paid to the time interval between reviews.
d. In some circumstances, specialist advice from, for example, geriatricians, might be necessary.
e. Initial supply and major repairs such as renewal of sockets would normally require to be carried out at the prosthetic section of the main Rehabilitation Engineering Centres but facilities for minor repairs and adjustments should be available at satellite centres. A fully-trained

prosthetist working in these centres, either full-time or on rotation, could be expected to judge whether or not any patient should be referred to a main centre.

f. All surgeons who undertake amputations should be trained in the basic surgical concepts of stump formation compatible with modern prosthetic practice. This is already an integral part of the training of orthopaedic surgeons and it is recommended that it should also be included in the training of all other surgeons who carry out limb amputations. Ideally the amputating surgeon trained in prosthetics should be responsible for prescribing his patient's prosthesis. The problems in fulfilling such an ideal are self-evident. The prescription and fitting service will continue to depend on occasional contributions from trained orthopaedic surgeons and, in some instances, on rehabilitation consultants specialising in prosthetics and orthotics.

g. Support from nurses, physiotherapists, remedial gymnasts, occupational therapists, social workers, disablement resettlement officers, and others familiar with amputee care will be required at the main centres, together with a suitable number of short-stay beds.

h. Child amputees would require special consideration. Experience has shown that older children with amputations prefer to receive treatment along with other amputees at the main prosthetic centres, but this is sometimes undesirable in the case of young children, especially where the amputation is necessitated by neoplastic disease; in these instances it would be preferable for the clinic team to travel to the child in the children's hospital or unit. The child could then be treated as an outpatient at the centre during the later stages of rehabilitation.

i. In the Tayside Area there is centralisation of services in Dundee facilitating collaboration between the related disciplines. In other areas the problems might not be solved so easily because of the geographical distribution of orthopaedic surgeons in relation to the main centres. Surgeons carrying out amputations might be brought into main centres for sessions at which they could retain responsibility for the prescription and checking out of prostheses fitted to their own patients, although, as indicated, the distance involved would make this inappropriate in some areas. There is a case for encouraging one surgeon at least in each Health Board District to develop a special interest in the field of prosthetics and orthotics. This will allow him to advise his colleagues and provide direct clinical support for visiting prosthetists and orthotists from the main Rehabilitation Engineering Centres.

j. In planning facilities for the provision of prostheses it will be necessary to study the overall population in Health Board areas and to break this down by age groups and new amputees. It will then be possible to plan satellite centres with adequate back-up from technical and remedial therapy staff, perhaps on a visiting basis. In some areas only 5 amputees require to be seen each week and this supports the need for joint prosthetic/orthotic facilities in such peripheral centres.

k. There is some evidence that elderly new amputees do not use conventional prostheses as well as the younger patients and may discard these in favour of a wheelchair existence. The reasons for non-acceptance are multiple and require further investigation. Factors which might influence acceptance could include patient motivation, the design and weight of limb provided and the rehabilitation and training facilities and organisation available. This highlights the need to investigate the extent of, and reasons for, the non-acceptance of conventional prostheses by elderly new amputees. This in turn may lead to the requirement to design simpler, lighter prostheses for this age group.

Orthoses

5.18 The prescription, supply and fitting of orthoses is more fragmented than the prosthetic service and at present comprises a complex service shared between the hospital workshop and the commercial suppliers. The Working Group envisages a gradual expansion in the orthotic workshop service as an integral part of the new Rehabilitation Engineering Centres, associated with a corresponding decline in the use of commercial services. However, it is acknowledged that both sources of supply will continue to be used into the foreseeable future and that, for the peripheral areas, there might continue to be the need for long-term provision of orthoses from commercial manufacturers, though ideally these should be fitted and checked by qualified orthotists working within the health service. There is an urgent need for the application of new techniques and for stricter control in the manufacturing and fitting of all items with these developments being largely supervised by the National Health Service orthotists. The following proposals were agreed as desirable long-term developments.

a. Medical staff should normally be required to prescribe orthoses and would also be concerned with checking out their fitting and effectiveness. Because of the long waiting time for hospital outpatient appointments, it is suggested that general practitioners should be able to prescribe simpler 'first-aid' items such as non-rigid cervical collars and simple spinal supports. A small stock of these items might be held by the larger health centres, but for the general practitioner working in a small practice it might be necessary for supply and fitting to come from independent contractors, or from Rehabilitation Engineering Centres or their satellite workshops.

b. Orthotic services should ideally be situated with the prosthetic services in Rehabilitation Engineering Centres. In a small peripheral centre, or in special situations, it might be necessary for orthotics services to exist in isolation but, in that event, they would be serviced by orthotists visiting on a once- or twice-weekly basis from the main centres.

c. For more complex disability the prescription and provision of orthoses should be the responsibility of the main Rehabilitation Engineering Centre and would involve a multidisciplinary clinic team. The doctor in charge would decide what the orthosis was required to do but it would be necessary for collaboration in the assessment, fitting and follow-up to involve interaction with the other professionals, particularly the rehabilitation engineer, orthotist, or occupational therapist, remedial gymnast and physiotherapist.

d. Patients fitted with a definitive orthosis should not have to visit the main centres for repair or renewal but should be able to arrange this through their local district general hospital. Should this hospital not have a suitable satellite workshop facility and not be able to carry out the repair or replacement it should function as an administrative post office. It is envisaged that schools for the physically handicapped will retain a close contact with their own district general hospital for this purpose, even though some of the children involved might be under the care of clinicians at other more distant hospitals. Ideally, with fuller development of the Rehabilitation Engineering Service, the need for stabilisation of orthoses should steadily diminish.

6 Areas for Further Study

6.1 The Working Group recommends the following areas for further study:

—the way in which the orthotic service should develop with particular reference to the relationship between commercial and NHS facilities and having regard both to the geographical distribution of physical facilities and to the quality of staff available (paragraph 3.18 and 3.20).

—assessment of the numbers of physically disabled that might be expected to use Rehabilitation Engineering Centres in different areas of Scotland (paragraph 5.5).

—the definition of the respective responsibilities of health and social work professionals for the supply of aids (paragraph 5.8).

—the definition of the role of the Rehabilitation Engineer within the rehabilitation speciality (paragraph 5.4).

—the extent of, and reasons for, non-acceptance of conventional prostheses by elderly new amputees (paragraph 5.17k).

—assessment of the adequacy of existing services for transporting patients to give them access to the prosthetic, orthotic and aids services discussed in this report (paragraph 4.7).

7 Summary of Conclusions and Recommendations

7.1 The developing rehabilitation services should play an increasing role in improving the present provision for the supply of aids, prosthetic and orthotic devices (paragraph 3.3).

7.2 The different services involved in the provision of National Health Service aids for the disabled should be more closely integrated. Health Boards should be asked to submit detailed reports on the service they provide at present and how they see it being developed (paragraph 3.4).

7.3 Remedial therapists shoud be given a greater role in the provision of aids for the physically disabled and in the prosthetic and orthotic services (paragraph 3.6).

7.4 Duplication of effort in the work of health service and local authority occupational therapists should be avoided (paragraph 3.8).

7.5 There is a need for the rationalisation and integration of the prosthetic and orthotic services (paragraph 3.9).

7.6 The funding of the prosthetic service by the Scottish Home and Health Department should be reviewed (paragraph 3.16).

7.7 There is a need for a simplification of the present supply arrangements for orthopaedic appliances (paragraph 3.20).

7.8 A technician training programme should be introduced into the National Centre curriculum as soon as possible (paragraph 3.22).

7.9 There is a need for a national body to oversee the training and education arrangements for prosthetists and orthotists (paragraph 3.22).

7.10 There is a need for improvement in the present method of documentation used for prescribing appliances for the disabled (paragraph 3.23).

7.11 Better methods are required to identify the unmet needs of the physically disabled in the community (paragraph 4.1).

7.12 There is an urgent need for planned development of specialised services for patients with spinal paralysis (paragraph 4.1).

7.13 For the elderly there is a great need for hospital-based services to have closer liaison with community services to ensure that there would be adequate support in the home environment on the patient's discharge from hospital (paragraph 4.3).

7.14 The rehabilitation aspect of the geriatric service should be extended in preference to further proliferation of long-stay accommodation (paragraph 4.3).

7.15 There should be a combined paediatrics/primary care service on a national basis to assess children for disability (paragraph 4.4).

7.16 Assessment of the handicapped child should function on a three-tier basis (paragraph 4.5).

7.17 There should be an expansion of the number of bioengineers working in the service for provision of aids for the physically disabled (paragraph 5.4).

7.18 A number of fully integrated Rehabilitation Engineering Centres should be developed in Scotland (paragraph 5.5).

7.19 Rehabilitation Engineering Centres and Rehabilitation Consultants should have a number of short-stay beds available for their patients (paragraph 5.5).

7.20 Health authorities should be encouraged to release all staff involved in services for the physically disabled for training and such training should be multidisciplinary (paragraph 5.6).

7.21 The medical undergraduate curricula should provide basic information in the prescription, fitting and adjustment of prosthetic and orthotic devices (paragraph 5.7).

7.22 Courses on the supply of aids for the disabled should be available to workers in local authorities and voluntary organisations (paragraph 5.8).

7.23 There is a need for improving the dissemination of information to all involved with the physically disabled (paragraph 5.9).

7.24 Aids Demonstration Centres should form an integral part of the Rehabilitation Engineering Centres when they are established (paragraph 5.10).

7.25 In developing research programmes the multidisciplinary character of the services must be kept in mind (paragraph 5.12).

7.26 The evaluation protocol produced by a sub-group of the Standing Committee on Prosthetics and Orthotics should be used as the base document for future evaluations (paragraph 5.14).

7.27 The Health Departments should be fully involved in the international aspects of research and development in evaluation of aids for the disabled (paragraph 5.15).

7.28 There should be a gradual expansion in the orthotic centre services and a review of prescription, fitting and manufacturing procedure is required (paragraph 5.18).

APPENDIX A

Prosthetics and Orthotics Committee

Chairman

Professor G Murdoch	Consultant Orthopaedic Surgeon, Dundee Limb Fitting Centre

Members

Professor R C B Aitken	Professor of Rehabilitation Studies, University Department of Orthopaedic Surgery, Princess Margaret Rose Hospital, Edinburgh
Miss M A Auld	Superintendent Physiotherapist, Royal Infirmary, Aberdeen
Dr T M Chalmers	Consultant Rheumatologist, Northern General Hospital, Edinburgh.
Mr D N Condie	Rehabilitation Engineer, Dundee Limb Fitting Centre
Professor D L Hamblen	Professor of Orthopaedic Surgery, University of Glasgow
Mr J Hughes	Director, National Centre for Training and Education in Prosthetics and Orthotics, University of Strathclyde
Mr D W Lamb	Consultant Orthopaedic Surgeon, Princess Margaret Rose Hospital, Edinburgh
Miss R Lloyd	Occupational Therapist, Dundee Limb Fitting Centre
Mr D McDougall	Research Orthotist, Dundee Limb Fitting Centre
Professor J P Paul	Professor of Bio-Engineering, University of Strathclyde
Professor J Williamson	Physician, Department of Geriatric Medicine, University of Edinburgh
Miss M A Wood	Nursing Officer, Dundee Limb Fitting Cenrtre
Mr D G Young	Consultant Paediatric Surgeon, Royal Hospital for Sick Children, Glasgow

STATISTICS

Table I

A. Estimated Numbers with different Degrees of Handicap in Scotland

Category	Degree	No	%
1–3	Very severe	16,000	5.9
4,5	Severe	35,000	12.7
6	Appreciable	57,000	21.1
7	Minor	56,000	20.7
8	Minor	111,000	40.0
	Total	274,000	100

B. Disabled per 1,000 population aged 16 and over

	Men	Women	Men and Women
Scotland	63.1	81.5	72.9
Great Britain	66.7	88.2	78.0

Sources. 'Handicapped and Impaired in Great Britain'
Amelia Harris. OPCS, HMSO 1971.
Health Bulletin, Vol XXX, No 2, April 1972.

Table II

A. Rates of Handicap per 1,000 of the Age and Sex Group

	All Disabled		Very Severely Disabled	
	M	F	M	F
16–29	10.0	7.9	0.5	0.5
30–49	30.2	25.6	0.9	0.9
50–64	85.6	84.6	2.2	3.0
65–74	211.4	227.1	5.4	10.6
75+	316.2	409.0	22.4	41.1
All Ages (16+)	66.7	88.2	2.4	5.4
	78.0		4.0	

B. Prevalence of Disability in a population of 10,000 by Age and Severity of Disability

Degree	16–64	65+	All ages
Very severe (1,2,3)	8.0	21.3	29.1
Severe (4.5)	23.7	42.0	65.9
Appreciable (6)	42.2	72.0	114.0
Minor (7.8)	165.0	195.0	859.0

Sources. As Table I.

Table III

A. Age and Sex Distribution of Men and Women in Great Britain who are very severely, severely or appreciably handicapped
(Categories 1–6)

Age Group	Men %	Women %	Total %
16–29	0.8	0.8	1.6
30–49	3.8	4.5	8.3
50–64	9.3	15.4	24.7
65–74	9.7	21.4	31.1
75+	8.0	26.3	34.3
All Age Groups	31.6	68.4	100.0

Estimated total no (GB)=1,128,000

B. Percentage of People with very severe handicap (categories 1–3) in each age group

Age Group	Very Severe Handicap %
16–29	3.2
30–49	7.6
50–64	16.5
65–74	22.1
75+	50.6
Total	100.0

Estimated no (GB)=157,000

Sources. As Table I.

Table IV

Main cause of Disability: Percentage in each Disease Group by Degree of Disability

Main Disability Group	Degree of Handicap Very Severe %	 Severe and Appreciable %	 Minor %
Infective and Parasitic Diseases	—	0.8	1.1
Neoplasms	1.8	0.9	0.8
Allergic, Endocrine, Metabolic and Nutritional Diseases	1.5	1.1	2.0
Diseases of Blood and Blood Forming Organs	—	1.3	0.7
Mental, Psycho-Neurotic and Personality Disorders	3.8	2.5	3.5
Diseases of Central Nervous System	40.1	12.8	8.9
Diseases of Circulatory System	10.2	12.2	18.5
Diseases of Respiratory System	2.7	6.0	11.4
Diseases of Digestive System	1.7	2.4	2.9
Diseases of Genito-Urinary System	2.0	1.4	0.9
Diseases of Sense Organs (excluding blindness)	1.2	5.1	7.9
Diseases of Skin and Cellular Tissue	—	—	0.8
Diseases of Bones and Organs of Movement	28.9	50.0	33.8
Congenital Malformations	—	0.4	0.6
Injuries	—	3.1	4.3
Senility and Ill-defined conditions	10.8	3.0	3.9
Amputees	1.5	2.9	5.0
Blind	2.5	1.5	2.7
All conditions	100	100	100

Sources. As Table I.

Table V

AMPUTATIONS IN 1976 BY AGE GROUPS

Figures include single amputations, cases involving amputations combined with another operation and cases where two or more amputations were involved.

Amputation or Operation	Age 0–24	25–44	45–64	65–74	75+	All Ages
Upper Limb at Elbow or Above	1	3	5	3	8	20
Forearm, Hand, Thumb or Finger	90	100	135	34	15	374
Lower Limb Above Knee	15	11	79	151	143	399
Knee and Below Knee	6	15	91	125	120	357
Foot or Toe	74	53	186	133	96	542
Repair or Revision of Stump	25	36	28	29	12	130
Others not classified	51	42	28	13	4	138
Grand Total	262	260	552	488	398	1,960

Source. Scottish Hospital In-patient Statistics Operations Index.

APPENDIX C

PROSTHETICS AND ORTHOTICS COMMITTEE: CURRENT RESEARCH PROGRAMME: DECEMBER 1980

Title of Project	Grantholder/Location	Starting Date	Duration	Total Grant Awarded £000
1. Upper Limb Prosthetic Hand Evaluation and Partial Hand Cosmesis	Mr D Lamb, Mr T Dick PMR, Edinburgh	8/77	1 year	8
2. KAFO Evaluation	Prof J P Paul Strathclyde University	10/77	4 years	57
3. Body Support Systems Development	Prof G Murdoch Dundee Limb Fitting Centre	10/77	3 years	38
4. Cast Bracing Evaluation	Prof J Mallard Aberdeen University	11/77	4 years	25
5. Lower Limb Alignment	Prof J P Paul Strathclyde University	4/78	3½ years	38
6. Telescopic Leg Development	Prof J Paul Strathclyde University	11/78	3 years	35
7. PMR Body Powered Hand for Children	Dr H Law, Mr D Lamb PMR, Edinburgh	1/79	3 years	4
8. Upper Limb Prostheses	Mr D Lamb, Dr H Law PMR, Edinburgh	3/79	1 year	17
9. Myoelectric Hand Evaluation	Mr D Lamb PMR, Edinburgh	3/79	1 year	5
10. Evaluation of SELSPOT Cait Analysis System	Prof J P Paul Strathclyde University	4/79	1 year	23
11. Development of Self-propelled Wheelchairs	Mr Hughes, Mr Shapcott Dundee University	8/79	1½ years	1.6
12. Evaluation of Aerazur Pneumatic Orthoses	Mr J Cook Edenhall Hospital	10/79	1 year	9
13. Comparison of A/K and B/K preformed socket systems	Mr J Christie PMR, Edinburgh	11/79	3 years	34

PROSTHETICS AND ORTHOTICS COMMITTEE: CURRENT RESEARCH PROGRAMME: DECEMBER 1980 (CONTINUED)

Title of Project	Grantholder/Location	Starting Date	Duration	Total Grant Awarded £000
14. Equipment for Cerebrally Palsied Children	Prof G Murdoch, Mr D Condie Dundee Limb Fitting Centre	11/79	3 years	37
15. Functional Electrical Stimulation Data Base	Prof J P Paul Strathclyde University	1/80	2 years	27
16. Mobility of the Elderly in bed	Dr J Barbanel Strathclyde University	2/80	2 years	26
17. Clinical Evaluation of an Ultra Lightweight Polypropylene below knee prosthesis	Prof J Hughes Strathclyde University Mr J Whitefield Southern General Hospital	4/80	1⅓ years	3.9
18. Free Range Amputee Assessment	Prof J P Paul Strathclyde University	6/80	2 years	28.7
19. Maximum contact wheelchair for patients with severe athetoid paralysis	Prof J P Paul Strathclyde University Mr Protheroe Glasgow Royal Infirmary	9/80	1 year	10.0
20. Development of electrically operated upper limb prostheses	Dr H T Law, Mr D W Lamb PMR, Edinburgh	9/80	3 years	29.0
21. Clinical evaluation of PMR/Thackray hand and glove	Dr H T Law, Mr D W Lamb PMR, Edinburgh	9/80	1 year	12.0
22. A powered mobility aid for chronically disabled	Mr A Shaw, Mr J S Paton Dept of Clinical Physics, Glasgow Dr J Runcie Stobhill Hospital, Glasgow	9/80	1 year	1.0
23. Development of body support system	Prof G Murdoch, Mr D N Condie Dundee Limb Fitting Centre	10/80	2 years	30.0

APPENDIX D

PROTOCOL FOR THE EVALUATION OF PROSTHETIC AND ORTHOTIC DEVICES AND AIDS FOR THE DISABLED

Introduction

About £4 million is spent by the Scottish Health Services on limbs and appliances each year and a similarly large amount is spent on aids. There is a further private spending of an unknown amount of money on various aids for the disabled. The Disabled Living Foundation and Equipment for Disabled and SISD provide information about available aids but this is based on advertising literature provided by firms and very little formal assessment is done. DHSS assess devices and aids as far as their safety is concerned and occasionally some clinical evaluation projects are mounted. A certain amount of aids assessment is carried out on behalf of DHSS but no rigorous evaluation has been done. There is a dearth of knowledge to guide the Health Departments as to the devices which should be approved for health service prescription and to guide prescribers in their choice of devices. Considerable savings would be effected if the information were available so that the most appropriate and best value device could reliably be recommended.

Evaluation studies of items of equipment which are to be attached to a patient to improve or replace some defective or missing function are notoriously difficult to perform with any rigour. The patient himself is an integral part of the system to be studied and only careful design of a protocol for evaluation can lessen the effect of variability from patient to patient. In order to embark on an evaluation, the function expected of the device must be specified and the device evaluated in comparison either with an ideal device defined by its function or by comparison with other available devices designed to achieve a corresponding function.

The following outline of a protocol for evaluation of prosthetic and orthotic devices and aids was originally developed in 1977 by a sub-group of the Scottish Standing Committee on Prosthetics and Orthotics whose work has now been taken over by the Prosthetics and Orthotics Committee.

Conduct of Evaluation

1. *Protocol.* A carefully prepared, clear, written protocol is a prerequisite of all evaluations. In preparing this protocol, account should be taken of the following guidelines, but in addition requirements applying to the particular device to be evaluated should be incorporated.

2. *Justification.* The need for a particular item to be evaluated for the benefit of the Health Service should be outlined and this may entail a survey of existing devices with similar functions. For example, if an item is in common use and is made by several manufacturers which may vary in performance or cost, or if it is innovative so that its place in the Service is not yet defined, then an evaluation may be justified.

3. *Aims.* The aims of the evaluation are to identify, compare and assess the characteristics of the devices in relation to the requirements of the patient and the clinic team.

4. *Ethical Clearance.* Permission to perform clinical tests with patients should be sought from the local Ethical Committee where required.

5. *Programme.* In order to fulfil these aims it is necessary to follow a programme which should include:—

i Physical testing which is concerned with the ability of the device to withstand the stresses to which it would be subject in service, storage and transportation. This may entail mechanical, structural, electrical and chemical testing.
ii Functional testing which is concerned with the ability of the device to exhibit the functional properties in use, which the developer attributed to it and to examine the desirability of these properties in relation to the user's disability.
iii Clinical testing which is concerned with the investigation of the patient and clinic team's views as to the effectiveness and acceptability of the prescription.
iv Measurement of cost-effectiveness which is concerned with information which influences the choice and selection of a device.

Attention will need to be paid, in constructing a programme of work, to the numbers and types of tests to be performed and the numbers and types of patients to whom the devices will be prescribed and hence to the statistical validity of the results. Details of tests and procedures which need to be covered are listed in Part II.

6. *Centres.* All the tests relating to a particular evaluation project should be under the control of a selected centre or organisation which

should have sufficient resources and access to patients from a routine clinical workload so that ideally it is capable of completing all of the tests. It is recognised that certain tests, in particular physical tests, might be better carried out at specialist centres and that the controlling group might consider it desirable to widen the scope of the evaluation by involving other centres in the clinical or other tests. It is essential that all such participating centres adhere to the agreed protocol so that a unified and consistent report can be written.

7. *Staff and Resources.* Staffing requirements must be estimated accurately at the outset of the evaluation, as must resources in the form of the laboratories and equipment required for the tests to be performed and also the users available to undergo them.

- i Staff
  - a. Some or all of the following categories of trained medical and paramedical staff will be required; clinician, bioengineer, nurse, prosthetist, orthotist, physiotherapist, occupational therapist, social scientist, technician.
  - b. For the efficient use of certain devices and aids, it is necessary that staff be trained in their application. This can be done either by other experienced staff or by the manufacturer as appropriate. Since the National Centre for Training and Education in Prosthetics and Orthotics will need to teach any new techniques of fitting required by an innovative device, it should be informed at an early stage in such an evaluation.
  - c. Firm decisions about the number of staff required to perform the extra work entailed by the evaluation must be made at the outset so that, where needed, extra staff can be employed during the evaluation.
- ii Users
  - a. Users selected, should be in the category for which the design is intended, and they should be representative, in respect of age, sex and severity of disability, of the total population in that category.
  - b. A sufficiently large sample of the relevant population should be selected for the results to be significant. The number required must be decided for the particular protocol. Both new and established patients should be involved and a control group should be established if possible.
  - c. Physical, psychological or occupational factors should not be likely to curtail the satisfactory participation of the users in

the evaluation. They should be reasonably objective and communicative.

   d. All users should be given uniform training with the device and a period of use should be allowed which enables the evaluator to be confident that the user is reasonably familiar with the device before the evaluation tests are begun.
   e. Any extraneous factors related to the interface between a particular user and the device should be eliminated, eg sockets for prostheses should be of a consistently high standard of fitting.

iii Laboratories and Equipment

   a. sufficient laboratory and workshop space must be available for the work to be undertaken. Consideration may need to be given to obtaining extra space during the evaluation.
   b. Capital equipment, consumables, necessary spare parts and maintenance facilities will be required for the tests and these should be considered in detail.

8. *Time.* Developments of new and improved devices are going on all the time so it is essential that a time limit be placed on the evaluation so that in the first instance only devices available on the market before a certain date are accepted into the evaluation and thereafter that the findings of the evaluation are reported as quickly as possible. This should enable decisions to be made about bringing approved devices into service without unnecessary delay.

9. *Cost Effectiveness and Supply Considerations.* In a comparative study a 'best buy' may be identified, although it should be kept in mind that different devices will be suitable for different groups of patients. An important finding would be to identify the characteristics of each group of patients and the device most suited to their needs. The needs of the user may differ at home, at work or in hospital. A discussion of the practicability of supply of the devices is required and this should take account of cost, availability, the training needs of staff and the amount of staff time required for fitting and training of patients. The views of the administrator will need to be sought for this aspect of the evaluation.

10. *Report.* The report of the evaluation should be in full, giving the analyses of the results of all the tests so far as possible in a quantitative form. It is recognised that in a clinical setting, this may prove difficult and some qualitative opinions would need to be expressed. The report should include a clear and concise summary of the major findings of the evaluation.

Protocol Design—II **Evaluation Tests and Procedures**

1. *Physical Tests*

   i *Physical Properties.* The physical properties of the device or aid should be measured in the laboratory. These may include, for example, measurements of physical dimensions, weight, position of centre of gravity; where relevant, the mass moment of inertia of all or part of the device or measurements of the range of movement of a joint etc.

   ii *Mechanical Tests.* Static and dynamic tests of the parts of the device and the device as a whole will need to be conducted in order to establish probable modes of mechanical failure. The device should be loaded in a manner consistent with its mode of use and appropriate strength tests performed and types of failure recorded. Where appropriate standards exist, as in the case for prosthetic devices; the device should be tested against the standard. These tests would include, for example tests of the resistive or assistive characteristics of an orthosis, or the functional effectiveness and reliability of a control system.

   iii *Electrical Tests.* Electrical components should be tested for robustness and also to ensure that no fault made could endanger the user of the device. Where applicable, it should be ensured that the device conforms to HTM–8 or to the new British BS5724PT1, 'Safety of Medical and Electrical Equipment in General Requirements' or to the European Standards, IEC601–1 as these come into force over the next two years.

   iv *Environmental Tests.* The device should be tested for its compatibility with the patient and with the environment in which it is to work. For example, it may be necessary to test the biocompatibility of the device and its resistance to chemical damage by cleaning agents.

2. *Functional Tests.* Functional tests are those designed to establish the characteristics of the device as far as its function is concerned. In order to carry this out, it may be necessary to try the device in a controlled way with a few closely monitored users. This would enable, for example, measurement of the pressure distribution at a patient device interface such as a socket for a prosthesis or wheelchair cushion. Another example of a functional test would be to try out a toileting aid with a disabled person to see if they would indeed be able to use it effectively.

3. *Clinical Tests.* Having carefully considered the numbers and types of users who will be involved in the trial and any necessary training of staff, as outlined in section I 7, a series of test activities needs to be designed.

- i *Test Activities.* The nature and range of activities will be determined largely by the type of device and the disability category of the user and hence the activity level at which he or she can be expected to achieve. Certain general conditions should however apply:—
  - a. A series of activities should be specified which relate to the normal mode of use of the device, both at home and at work.
  - b Consideration should be given to the possibility of conducting these test activities in the home or at work.
  - c. The order in which the test activities are performed should be considered so that its influence can be eliminated.
  - d. If the device is designed to be used away from the hospital, then some note should be taken of the amount of time for which it is used other than during test periods.

- ii *Recording of Data from Clinical Tests.* Whenever possible the data should be recorded using structured responses, questionnaires and data forms and these should be developed, with the help of a social scientist if necessary, to record the points of view of the user and members of clinic teams as follows:—
  - a. User—a questionnaire is required to assess the objective views of the patient as to the function, comfort, appearance, ease of use, perceived energy consumption and amount of use both at home and at work.
  - b. Clinician—He/she will need to assess whether the overall function required for the patient has been achieved and will need to draw up a clinical profile containing relevant medical history and previous use of devices.
  - c. Prosthetist, orthotist or technician—The device will need to be evaluated with regard to its ease of manufcture, its fitting and alignment if this is relevant and its ease of maintenance.
  - d. Bio-engineer—Apart from the intrinsic strength and wear properties which are assessed in the laboratory, the bio-engineer will need to assess the function of the device from a bio-mechanical point of view when it is in use. This may involve measurement of energy consumption by the user, of gait, of accuracy and sensitivity of powered devices in use. Some record will need to be kept of the reliability of the

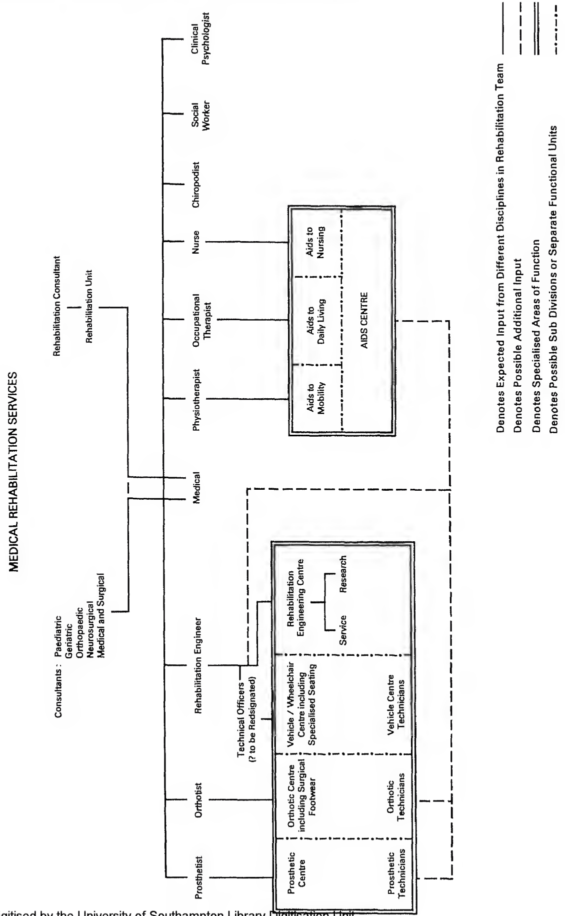
device, ie the number and severity and timing of breakdowns and of the long term wear properties of the device.

e. Physiotherapist, occupational therapist—The therapist will need to record any special considerations covering the training of the patient in the use of the device and in donning and doffing as necessary.

f. Nurse—The nurse will need to assess the effect of the device on the general well-being of a patient and, where a device is to be used by nurses, the function, ease of use and general acceptability in the ward and in the home.

APPENDIX E

MEDICAL REHABILITATION SERVICES


MEDICAL REHABILITATION SERVICES
Rehabilitation Consultant
Rehabilitation Unit
Consultants : Paediatric
Geriatric
Orthopaedic
Neurosurgical
Medical and Surgical
Prosthetist
Orthotist
Rehabilitation Engineer
Medical
Physiotherapist
Occupational Therapist
Nurse
Chiropodist
Social Worker
Clinical Psychologist
Technical Officers (? to be Redesignated)
Prosthetic Centre
Orthotic Centre including Surgical Footwear
Vehicle / Wheelchair Centre including Specialised Seating
Rehabilitation Engineering Centre
Service
Research
Prosthetic Technicians
Orthotic Technicians
Vehicle Centre Technicians
Aids to Mobility
Aids to Daily Living
Aids to Nursing
AIDS CENTRE
Denotes Expected Input from Different Disciplines in Rehabilitation Team
Denotes Possible Additional Input
Denotes Specialised Areas of Function
Denotes Possible Sub Divisions or Separate Functional Units